CYBERWORLD

TEACHER'S RESOURCE GUIDE

Flip the pages of this book to see "Buzzed" chase after the Code.

For Teachers

The *CyberWorld* Teacher's Resource Guide is designed to help you and your students learn about computer **animation**, and can help enliven the way you teach the basics – from language arts to mathematics. Through interesting information and engaging activities, your students will discover what animation is, how it is created, and its applications to many aspects of their lives.

Definition

The word **animate** means 'to give life to'.

This flexible resource draws on concepts from the film to create an enjoyable and relevant learning experience for your students. It links directly to many areas of curricula. *(See the curriculum links chart below.)*

As you plan how this material can best meet the needs of your students and your curricula, consider that the activities and information:

- are written for young people ages 9-16 and range in depth and difficulty.
- can be adapted to meet students' varying needs and abilities.
- are non-sequential, allowing teachers the flexibility to choose those activities that address their specific curriculum.
- can be a starting point for further discussion, exploration and creative learning experiences.
- include a 'Challenge' component for older or more advanced students.

Included at the back of this guide is a CD-ROM containing animation software called Fantavision™ that students can use to do some of the activities in this guide and create their own simple animations. This PC-based program is set up for use on Windows 95/98 platforms. (See back cover for additional installation information.)

Computer Animation in the Classroom

Students who are engaged and having fun while learning, learn faster and retain more of the information. With a generation of visually-minded young people brought up on video games, computer animation can be a stimulus for learning in a classroom. Basic computer animation is also fairly accessible and can be run on most computers available in schools. A graphics approach can be an effective learning technique as it provides opportunities for students to reinforce basic computer skills and to develop creative thinking and problem-solving skills, e.g., making an animated clip. These same skills can be applied in other disciplines and subjects.

Curriculum Suitability

The concepts are drawn from the film and reflect the learning outcomes set out in the U.S. National Education Standards for art and science and those found in most provincial curriculae in Canada for grade levels from 3 to 9. The material in this guide is suitable for Key Stages 2-3 in the UK National Curriculum, and covers a variety of subject areas as listed below.

Curriculum Links

Computer Studies

- discusses basic cyber-technology
- answers elementary questions about programming
- introduces cyber-cartooning and Internet animation

Sciences

- introduces simple concepts in the biology and neurology of how we see
- creates an invention that has practical applications
- describes examples of technologies that did not exist in the past
- explains how technologies impact our lives
- describes scientific contributions made by people from around the world

Cultural/ Social Studies

- introduces basic ideas of how animation and cartoon characters reflect popular culture, customs and society
- examines simple timelines to understand historical events

What Do Your Students Know About Animated Films?

Choose one of the following activities to set a context for your students to view *CyberWorld* and to introduce the concept of animation.

Activity 1

- Guide a class discussion by asking questions such as:
  - What are your favorite films, television shows, or videos?
  - What are the qualities or elements that determine what you like?
  - Are the starring characters in the show cartoons or real people?
- Introduce the term animation as a way characters are brought to life.
- Ask the students to name which animated television programs or feature films they watch and what they enjoy about this type of show.
- Have them write or illustrate a part of their favorite animated show.

Activity 2

- Begin by introducing the term animation and having the students explain what they think it means.
- Working in small groups or pairs, have students identify two current and two older animated shows and discuss the differences in the music, story line, dialogue, and characters.
- Direct each group/pair to create a chart comparing these shows, with sections for storyline, characters, action, music, etc.
- As a class, compare the similarities and differences in current and older animated productions recorded on their charts.

Challenge

As you and your students view *CyberWorld*, have them think about the elements of the film that are different or similar to the ones on their chart.

Visual Arts
- illustrates a concept
- creates a basic image using perspective, design and form
- describes ways artists use their tools
- demonstrates a knowledge of movement
- learns how animators use storyboards
- creates animations

Language Arts
- learns about story sequence
- writes a script
- conducts an interview
- writes a letter
- summarizes information
- predicts and analyzes

Media Studies
- discusses the history of animation
- identifies the effects of technology on media arts
- uses a variety of techniques to create media arts
- describes how media arts affect daily life

Mathematics
- calculates
- uses perspective and ratio
- draws on knowledge of angles and sizing
- visualizes and constructs two- and three-dimensional shapes

Welcome To The World Of Animation

Section 1

In this section you will:

- learn about the concept of persistence of vision
- learn the basics of how animation is created
- create a flipbook

Persistence Of Vision

"Lights! Camera! Action!"

That's what you might normally hear when a director is filming a movie. A few very special films, however, do not use live action at all, or even big lights and fancy cameras. Instead, the films use a series of still pictures, like the kind you might draw in a sketchbook or on computer art pad, arranged one after the next with very small changes in each **frame**. When these images are seen very fast, one after the other, they seem to be moving. But of course, they're not!

Definition

Persistence of vision refers to the way the human brain sees an image for a fraction of a second longer than the eye actually sees it.

Individual pictures in a finished cartoon are called **frames**. In film, still images go by at a rate of 24 frames per second.

In 1824, physician and famed thesaurus-author Peter Mark Roget proposed a theory to explain this and called it **persistence of vision**. He came to this idea when, looking through the slanted Venetian blinds in his office, he spied a moving horse and cart and noticed that while looking between two slats the wheels appear to be stopped.

Motion picture experts now agree that how we perceive motion involves more complicated ideas about flicker rate and film speed, but Roget's theory started people thinking and led to some interesting inventions.

Have your students try the activities in this section to learn first hand about persistence of vision by making a thaumatrope or using the complementary software to do the sliding square activity and gain hands-on experience with computer animation.

Teacher: Prepare to use the PC formatted Fantavision™ program by installing the CD included at the back of this guide. Click on 'Load Movie' to show some Fantavision animation demo clips, and then use the Sliding Square activity on pages 6 & 7 of this guide. *(Look for the student renditions of Buzzed that were included with the Fantavision program!)*

Be sure to take a look at the Fantavision math, science and art animations located on the Fantavision program. Science simulations represent weather, DNA, evolution, optics and mitosis processes.

For information and examples of persistence of vision, visit www.povray.org

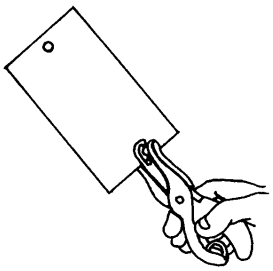
Persistence Of Vision: Make A Thaumatrope

Persistence of vision means that your eye still holds on to an image for a split second after it disappears. This helps us perceive continuous motion even where there is no movement. The thaumatrope was invented in the 1820s. It is a simple device that works on the concept of persistence of vision.

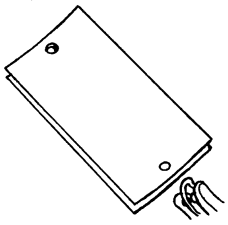
Make a simple thaumatrope to see how this works. You will need the following:

- two index cards (3"x 5")
- a hole punch
- two 2" rubber bands

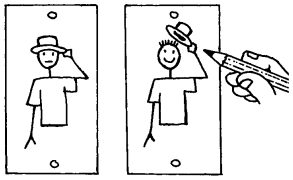
1. Punch a hole on the side of one of the cards. Punch a hole opposite the first one on the other side of the card.



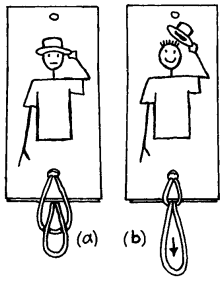
2. Place the second card on top of the first and align the sides of the two cards. Punch holes in the same spots on the second card.



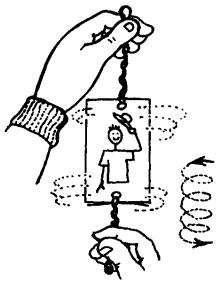
3. Draw a simple picture in the middle of card one. Draw a different picture on the second card that goes with the first picture. Place the cards back to back with the pictures showing.



4. Thread a rubber band halfway through the holes on one side. Thread one loop through the other to create a knot. Repeat on the other side of the card using the second rubber band.



5. Spin your thaumatrope.
What do you see?



CLICK ON THIS!

To learn how to create a Zoetrope and a Thaumatrope, visit Ruth Hayes' Random Motion website at www.halcyon.com/rhayes/html/zoe.html and www. halcyon.com/rhayes/html/thauma.html

ACTIVITY!

Persistence Of Vision: Making A Sliding Square Using Fantavision™

To see how **persistence of vision** works, you will make a square move to each corner and back to the starting position. To do this you will make four frames, each containing a still picture. When it is complete, the square will move in the direction displayed below.

Making Frame 1 of the Sliding Square

- Use the File menu to give the *clear movie* command (and the *Clear Backdrop* command if necessary) to erase any frames that may currently be in your file workspace.
- Check the *frame identifier* in the upper right corner of the screen to be sure that it displays '1' as the frame number.
- Use the *make rectangle tool* to draw the square as shown.
- Select a color from the *color palette.*

Making Frame 2 of the Sliding Square

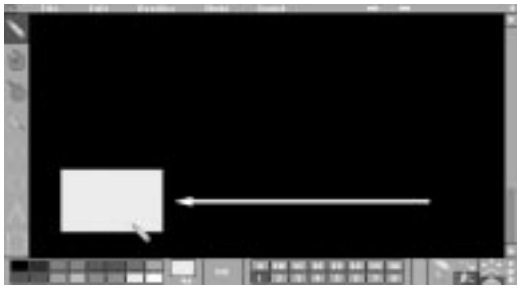
- Use the Edit menu to give the clone frame command to create a second frame that is a duplicate of the first.
- Check the frame identifier in the upper right corner of the screen to be sure it displays '2' as the frame number.
- Use the capture box tool to capture the square. The square is captured when you see a white outline around it.
- Drag the square to the upper right corner of the screen.

Making Frame 3 of the Sliding Square

- Give the *clone frame* command to create a third frame that is a duplicate of the second.
- Check the *frame identifier* to be sure it displays '3' as the frame number.
- Check to see that the square is already captured. If not, capture it.
- Drag the square to the lower right corner of the screen.

Additional information about the "sliding square" lesson on page 6 is available on the enclosed CD-ROM at the back of the guide.

Making Frame 4 of the Sliding Square



- Give the *clone frame* command to create a fourth frame that is a duplicate of the third.
- Check the *frame identifier* to be sure it displays '4' as the frame number.
- Check to see that the square is already captured. If not, capture it.
- Drag the square to the lower left corner of the screen.

The following instructions let you see how your eye fills in the motion to make the square appear to be moving clockwise.

Viewing and Controlling the Sliding Square

- Click on the *GO* command at the bottom of the screen to view the animation.
- Press '9' on the keyboard while the animation is running. This instructs Fantavision™ to display only the four frames you created, with no in-between positions.
- Press '8' to illustrate the concept of tweening. Look carefully at the motion and you may be able to see the four additional positions drawn halfway between the originals.
- Then press 7,6,5,4,3,2,1 to slow the speed of the animation by adding more tweens. The eye thinks it is seeing a square moving around the screen, actually there are hundreds of squares being drawn and erased in a sequence.
- Press the space bar to pause and restart the animation.
- Press *Esc* or click the mouse to stop the show.

Challenge

Using the same principles, make a *bouncing ball* animation. Use the circle tool to make the ball any color or any size you choose. Have your ball bounce as many times and in any direction you wish. Try adding sounds by using the sound menu to give the select sounds command. You can also try adding two, three or more objects to your animation.

DID YOU KNOW ?

Based on his experience teaching computer animation at an inner city school, Textbook Software Publishing's founder, Mike Trusiewicz, wrote the tutorial textbook *Computer Literacy: A Graphics Animation Approach Using Fantavision*, after seeing how excited and motivated his students had become.

How Animation Works

Definition

Animators are the men and women who draw the characters for animated films.

Cels are individual drawings for an animated sequence that are traced on clear plastic sheets.

A **caricature** is an exaggerated picture of a real person or object.

Animating a movie is different from live-action filming. For many years, **animators** drew hundreds and thousands of tiny drawings, called **cels**, that were filmed one after the other on a movie reel, and the pictures seemed to come alive. Today, much more animation is done using computers. The animators design the characters you see moving around on screen, and then tell the computer how they want these characters to move and speak and dance and fly – like the characters you see in *CyberWorld*. Remember, these characters aren't actually moving! It is simply an illusion, like a magic trick.

For very short animations such as television commercials, the animator may have only two seconds or 60 frames to define the character. In these cases, animators often resort to **caricature** and stereotype to establish the character as quickly as possible. In longer film formats, the animator has more time and frames to develop the characters.

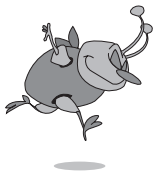
DreamWorks/SKG/PDI

For the movie *Antz*, the animation company, PDI, developed a new facial animation system to animate the faces of the antz, e.g. when the mouth moves, so do the cheeks and eyes.

Special computer software helps animators make their characters come to life. To find out more, visit the *Antz* website at www.antz.com.

TEACHER NOTE

The characters created by the students can be used for the storyboarding activity on page 17.



Activity 1

Animated Characters!

You can often tell how an animated character acts by the way it looks.

- Work with a partner to create a character that you can animate.
- Think about how to create your character so people can tell what it is like from the way it looks.
- Decide:
  - What traits your character will have,
  - How it will act,
  - What it will look like.
- Name and describe your character.

Activity 2

Move Like An Animated Character!

When animators create new characters, they often use people as models to work out the character's movements. Work with a partner for this activity.

Part A

- Decide on an action. For example, you might get up from a chair.
- Move your arms, hands, head, legs and torso in slow motion.
- Your partner records the number of changes in position your body makes.
- Switch roles and do the action again.

Part B

- Imagine you are an animator and have to draw your partner's movements before you can animate them.
- Your partner starts with his/her arm high in the air and moves it slowly down to the desk.
- Count the number of moves it took to get to the changed position.
- Draw one figure for each change of position.
- Place your drawings in order.

Part C

- Repeat the series of arm movements that you did in Part B.
- Move another part of your body at the same time.
- Your partner adds the new movements to your series of drawings.
- What do you notice?

Challenge

Try this activity moving several body parts – head, arms, legs, torso or hands simultaneously.

DID YOU KNOW ?

The Disney Studio perfected the ability to bestow unique, endearing personalities in characters including: Mickey Mouse, Pluto, Goofy, the Three Little Pigs, and the Seven Dwarfs.

ACTIVITY!

Make A Flipbook

A flipbook is a booklet containing a series of images that gives the illusion of movement when you thumb through them quickly. It is an easy way to understand how animation works. You will need:

- 10 pieces of 3"x 5" or 3"x 3" heavy paper
- crayons or markers
- heavy-duty stapler
- tape

1. Number the pages on the top edge (the edge that will be stapled). NOTE: If you are left-handed, staple your flipbook on the right side to make it easier for you to flip.

2. Draw one illustration per page. For example, if you've decided to draw a bouncing ball, draw and color a ball near the bottom of the sheet on the left side.

3. On the next sheet draw the same ball, but this time a little higher on the paper.

4. Draw the ball in a different position on each remaining piece of paper.

5. Stack the papers in order and staple them.

6. Cut a piece of tape the same width as the flipbook, and place it over the edge with the staples.

7. Use your thumb to try out your flipbook.

8. Exchange flipbooks with a friend.

Challenge

Complete a 'Buzzed' flipbook

A hungry 'Buzzed' is looking for code dinner. Complete the flipbook on the opposite page to see if he is successful.

The Kinora viewer invented in 1897 is a type of flipbook. By 1908, it was a popular way of viewing pictures. By turning a handle, a reel revolved causing the pictures to flip over against a peg while the person viewed the moving pictures through an eyepiece.

Credit: National Museum of Photography, Film & Television/Science & Society Picture Library.

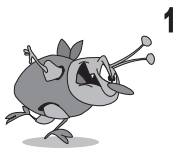
Follow these instructions to complete the flipbook.

1. Cut out each square on the dotted lines.

2. Place them one on top of the other in numbered order.

3. Staple the drawings together on the left hand side.

4. Flip to see if 'Buzzed' eats the code!



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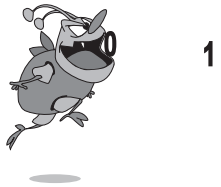

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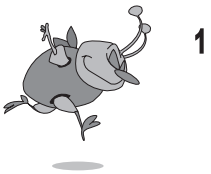

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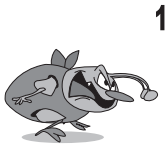

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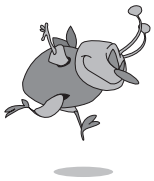

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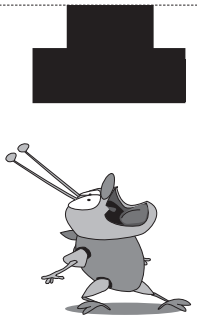

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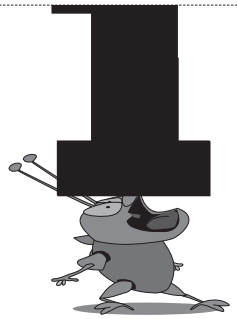

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The Roots Of Animation

Section 2

In this section you will:

- learn about the photographers and scientists who paved the way for today's animated films
- research information about the history of animation
- work with timelines

From The Storyteller To The Screen

Thousands of years ago, storytellers told their clans and tribes grand tales of the hunt using shadows, gestures, and noise to bring woolly mammoths and saber-tooth tigers to life in their fire-lit dwelling-places of cave and forest. Centuries later, the technology that gives us modern cartoons slowly developed. It began with shadows projected on a wall, and became an elaborate collection of gizmos and gadgets for the would-be animator in the 1800s. With the invention of cinema and the concept of movie theaters, animation grew into a popular form of entertainment.

Many animated movies were produced early in the 20th century but the Walt Disney studios were the first to successfully incorporate sound, color and multiplane effects into animation. Along with the American legacy of animated classic films, came award-winning animated films from other countries around the world, among them Czechoslovakia, the former Yugoslavia, Russia, Canada, France and Japan. Over the years and in many cultures, adults and children have enjoyed animation and have had marvelous adventures with animated characters they saw on screen. Today, we enjoy our own adventures with animated films like *CyberWorld* because of the many high-tech advances made in computer animation and film production.

ACTIVITY!

An Animation Timeline

There are many key events that contributed to the development of animated films. Complete one of the following activities to learn more about these events.

Check out the *Peanuts* timeline and find out about Charles Schulz and the history of the *Peanuts* gang, at www.unitedmedia.com/comics/peanuts.

Activity 1

- Choose one of the events on the timeline.
- Find out more about it.
- You might visit the library or use websites suggested by your teacher.
- Decide how to present your findings. You might write a report on the event or illustrate it and add a caption.

Activity 2

- Find one interesting fact for each of these events.
- Illustrate each event and include the fact.
- Display your timeline.

Challenge

Prepare an audio tape recording of your facts and place it with your timeline.

The Roots Of Animation Timeline

The following chronology shows some significant developments or accomplishments related to film, television, computers and animation.

1831

Picture animation was invented by Joseph Antoine Plateau, who used a machine called a phenakistoscope to create the illusion of movement.

1860

The Zoetrope, an invention of mathematician William George Horner, used moving portable cylinders to demonstrate persistence of vision. This invention became a popular toy in France.

1872

British-born photographer, Eadweard Muybridge, filmed the first photo sequence, a galloping horse to settle an argument – did all four hooves of horse leave the ground for an instant? Does a horse actually fly?

1888

Thomas Edison, known as 'The Wizard' for his many inventions, created the first real motion picture camera called a kinetograph in his laboratory in Newark, New Jersey.

1895

Louis and Auguste Lumière, of Lyon, France, patented a device called a cinematograph to project moving pictures and opened the first public movie theater later the same year in Paris.

1928

One year after the first live-action movie with sound was made, Disney created the first animated movie with sound and called it *Steamboat Willie*. It featured a brand new character called 'Mickey Mouse'.

1952

The National Film Board of Canada won the first of five Oscar® awards for its animated films for *Neighbours*, by Norman McLaren.

1958

William Higinbotham, of Upton, New York, invented the first computer game, Pong. Released by Atari in 1972, it became the first successful video arcade game.

1959

The computer microchip was invented.

1965

The first animated Peanuts television special, *A Charlie Brown Christmas*, aired on CBS Television in the U.S.

1971

Intel built the microprocessor, a 'computer on a chip', called Intel 4004.

1975

The first mass produced home computers were introduced.

1986

IMAX Corporation premieres full color IMAX 3D at EXPO'86 in Vancouver, Canada.

1988

Tin Toy was the first computer animated film to win an Academy Award®.

1995

Pixar Animation Studios created the first completely computer-generated animated feature film with the landmark *Toy Story*.

2000

Disney released *Fantasia 2000*, a re-launch, with new sequences, of their classic 1940 movie for the giant IMAX screens.

Photos by year:
1860, 1872, 1895 – Credit: National Museum of Photography, Film & Television/Science & Society Picture Library
1988 – Tin Toy © Pixar Animation Studios

From Story To Animation

Section 3

In this section you will:

- learn about animation in films
- see differences in 2D and 3D animation
- understand the process involved in going from a script to finished animation
- discuss ethical issues in animation

From 2D Paper To 3D Playground

Definition

Rendering means to color or to paint. After the animator has finished creating the characters, they are painted.

Flat surface animation has no dimension or complete shape – like characters that you see on televison. You view them only from one perspective.

3D scenes are animated in such a way that the characters' action and setting seem to stand out from a flat surface, as if they were 'real.'

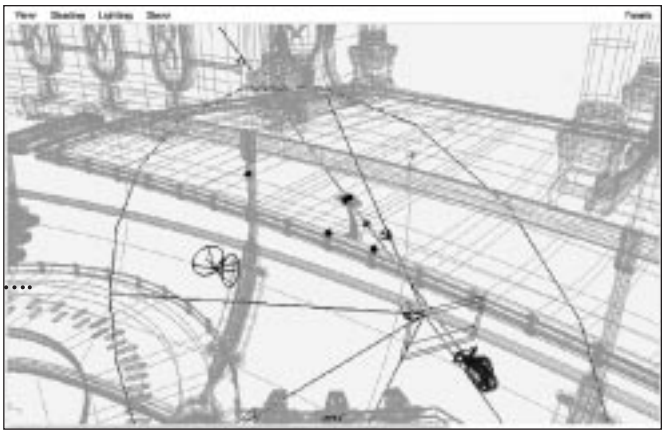
Animators can use a variety of techniques to accomplish the same goal – telling a story and bringing it to life. Animation creates the illusion of motion with a series of images. These images can be created by the pen of a cartoonist, the knife of a sculptor, the posing of a clay object or puppet, or the pixel manipulation of the computer artist.

For many decades, cartoon animators created all their work on flat surfaces and then painted the characters using a technique called **rendering**. Some animators still choose to create **flat surface animation** because it suits their particular technique, whether with a pencil and paper, paint or computer.

For about the past 15 years, more and more animators have been turning to the use of computer generated images (often called CGI) to make animation. Movies, television and the advertising industry have used CGI for many years to create special effects, creatures, backgrounds and other elements for their programs. The newest and most exciting development in animation came with the development of **3D**, or multi-dimensional, computer animation software. With this software, animators are able to create environments with complex lighting and shadow manipulation and do wonderful things in character animation. With more powerful computers, more sophisticated software and a growing pool of talented animators, computer graphics continues to deliver ever increasing levels of realism.

Visit the Pixar website at www.pixar.com to find out how cameras inside computers were used to create *Toy Story.*

A camera inside the computer records images that are then edited into a sequence. Camera technology has evolved over the years from the photographic camera to the videographic camera and now to the 3D computer camera. This is an 'eye' built into the computer that allows the animator to rove anywhere in the animated dimension – up or down, side to side, even through walls! Details like light and shadow are simulated in the image, depending on where this hyper-advance camera is sent to roam.



SPIN PRODUCTIONS

TEACHER NOTE

Use this information as background for activities on page 17 and 18.

A Story, A Script And A Storyboard

A good **story**, even if it is very short, is crucial to successful animation. If you want the audience to pay attention to your animation, you must tell an interesting story built around an engaging character. The story plot develops the characters, includes conflict and builds to a conclusion.

A character's personality determines its actions that then have an effect on the audience and move the story along. It is the animator's job to make the script come alive through the way the characters move and speak. Before the filming of an animated movie begins, voice artists record the words spoken by the characters. Then, animators make sure that the characters' lips move accordingly. Since the characters can't speak, they lip-sync the words.

Good stories contain conflict between the character and his environment and other characters that forces the character to change and grow. This change and growth must be consistent with what we have already seen of the character, e.g., a playful character shouldn't suddenly lose his fun-loving side unless it's part of the storyline.

Good stories have a natural ending. The conflict has been resolved, the characters have completed their roles, and often, there is a happy ending so that everyone leaves the theater smiling.

A **script** describes how a story is told. The writer decides how the words and actions of the characters and the events will work together to tell the story.

A **storyboard** (see page 16) is the framework for the creation of the whole feature film. In creating the storyboard, the animators work out the most important part of any film – the story. What is the plot? Who are the characters? Where do they meet and what do they do? How does it all work out in the end? The animators answer these questions as they design their storyboards

Page 2
INTERIOR: GALLERIA ANIMATICA

The camera travels down to a raised platform on the lowest level. From the floor of the platform a wireframe forms of a young woman as the camera moves around her. The camera comes to rest behind her as the skin forms on her body. She comes to life and looks up in awe, unaware of the audience.

PHIG

Whoa! Those brainiacs actually did it.

She turns and is surprised to see the audience.

Stepping off the raised platform she walks to one of the circles set into the floor.

PHIG

'names Phig ... I'm your guide.
Welcome to the Galleria Animatica where art and science come together to create . . . magic.

DID YOU KNOW ?

Film script pages generally follow a standard format. "Interior" means the action takes place inside. The indented words are dialogue – what the characters say.

What Is A Storyboard?

Storyboards were developed in the Disney studios in the late 1920s as a way of visualizing the flow of the entire story at once. By the mid 1930s, most Hollywood studios were using them as a means of preplanning and managing film production.

A piece of uninterrupted animated action between changes in viewpoint is a scene. There can be several scenes in one segment of the story. Imagine an animated version of Cinderella running away from the Prince's ball. One scene would be Cinderella rushing to the stairs.

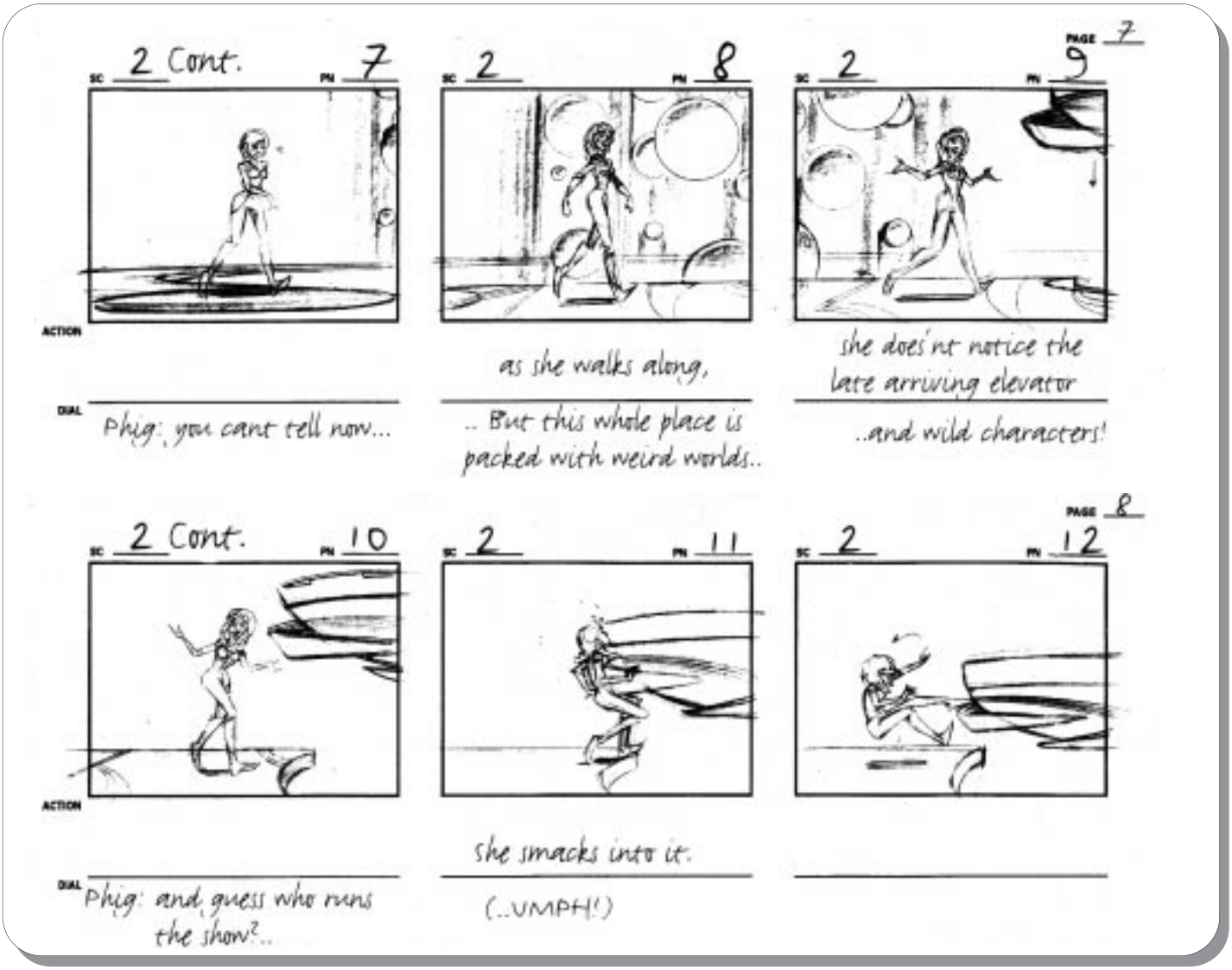
The next scene would be a close-up of her foot losing the glass slipper.

The next would show Cinderella throwing herself into the pumpkin-coach. Each individual part – the losing of the slipper, the entrance to the coach – is captured in frames for the storyboard.

The *CyberWorld* storyboard below shows how the animators mapped out the action and the dialogue.

DID YOU KNOW ?

Early rough storyboard sketches are referred to as *thumbnails*, while more detailed drawings are called *final storyboard* panels.



ACTIVITY!

Fun With Storyboarding

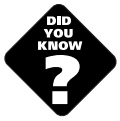
The storyboard is one of the most valuable tools used by an animation director in producing the film.

- Begin by writing a story.
- Choose a main character and one or two secondary characters.
- Think about the following questions as you develop your story:
  - How does the main character relate to the other characters?
  - What is the conflict in the story?
  - With which character is the main character in conflict?
  - Which character helps the main character?
  - What happens when this character helps?
  - How does the story end?
- Write your story as a script.
- Decide:
  - How many scenes it has
  - What the setting for each scene will be
  - What events happen in the scene
  - How the characters should look and move in each scene
  - What the characters will say
- From your story, pick one scene and draw a simple sequence of the events.
- Use stick people to tell the story.
- Add dialogue and directions.
- Use the Fantavision animation program or another animation software to bring your story to life.
  - With the copy and paste commands, re-create each of the frames in your storyboard. Start by drawing your character once and then copy (or clone) the frame to different places on the computer screen.
  - Use the Help manual on the CD to guide you along.

Challenge

Choose one event to animate.

- List each key detail like you did in your script.
- Create a mini storyboard to show this event.
- Animate the event using Fantavision or another software program.



Often images in a storyboard are filmed with audio so that each image is recorded for the appropriate amount of time it will appear in the final movie. This is traditionally known as an *animatic* or *Leica Reel*, but sometimes it is just called a *story reel*.

ACTIVITY!

Storyboard Jigsaw

A teacher-led activity

- Divide the class into home groups of four.
- Each home group includes students who will develop expertise in the following roles:
  - director
  - writer
  - storyboard artist
  - animator
- To make the groups as balanced as possible, place students with natural abilities in a particular area, in separate groups, e.g., assign strong writers to different groups.

Step 1

- Students form their expert groups.
- Within each expert group, students research their role in the group storyboard creation.
- Distribute the information on *Careers in Animation* (page 24) and *A Story, A Script, and A Storyboard* (page 15) to each group.
- Encourage them to read and include relevant information from these sheets in their notes. Students may also research more information at the public or school library or on Internet sites you have identified.

Step 2

- Students return to their home groups and discuss their individual roles in the storyboard creation. Members of the home group should offer advice to the writer about what to do for the story.
- As the group creates its story, it should consider:
  - main character – appearance and personality
  - relation to other character(s)
  - conflict situation – what?
  - with whom? – why?
  - character who helps resolve the conflict
  - conflict resolution
- The groups write their stories in point form; writing the story serves principally as a stepping-stone to the creation of the storyboard.

Step 3

- The students work in-role in their home groups to create a storyboard for animating their story.
- The groups can then use a software program to make their story into a film.

A feature film containing the production of 250,000 drawings would take fifty years of labor if all were to be drawn by a single artist. That's why film studios employ up to a hundred animators to make one film.

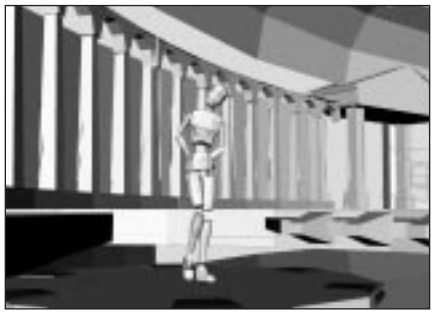
How Do Animators Take A Flat Image And Make It 3D?

Have you ever built a model car or house or ship, or played with Lego blocks? Animators play with these same tools after they create their storyboards for a 3D cartoon. Instead of using real blocks or pieces, they use lines and shapes on a computer screen. The model they create appears to be 'real' on the screen. It can be examined upside down, side-to-side, or from high above, all at the click of a mouse. The model is a complete work of 3D animation – except for one important detail – you can see right through it! Because the color or 'shell' has yet to be added, the model has the look of a skeleton or piece of art made of wires. It is called a **wire frame representation**.

Another way to complete this step is to use human models. Fashion designers and photographers use models to demonstrate the living, breathing, walking incarnations of their ideas in art. Pencil-and-pen animators use models to inspire the faces of the various heroes, heroines, villains, and villainesses in their films. They draw and modify the model time and time again to bring characters to life in two dimensions. When they need to model a complex shape such as the human face with its many curves and lines, they sometimes use a technology called **automatic modeling**. Using a 3D scanner, the job takes only a few minutes to complete. A laser moves rapidly over the model and scans the image into the computer.

To animate movement, 3D animators go one step further. They hook humans up to special motion-sensing machines, using electro-magnetism to make their cartoon creations mimic whatever motions the 'hooked-up humans' are doing! This technology, known as **performance animation**, is very common in computer-animated 3D. It is also much easier than creating and animating wire frame representations throughout the film's production process.

The images shown represent some of the key stages in the animation process.



Grey Scale Animatic

Wire Frame

Flat Shaded Area

Finished Composite

Definition

A **wire frame representation** is like a skeleton drawn for the character, using computer animation software.

Automatic modeling is a technology that scans a human body or face (or both) into a computer for use in creating an animated character.

Performance animation is used in computer-animated 3D to make cartoons mimic the motions of humans who are hooked up to special motion-sensing machines.

"It's Alive!"

Definition

Morphing is a computer procedure where one image blends seamlessly into a different image usually while the background or other parts of the scene remain the same.

Short for *in-betweening,* **tweening** is an animation technique that animators use to generate intermediate frames in sequence.

Both **anaglyph** and **polarized** 3D use 'filters' to block one eye's image out. The special glasses you wear to view the photograph or movie allow both left and right eye images to be seen together to give a 3D effect. Polarized 3D uses two separate full color film strips that produce a higher quality than anaglyph.

This line was made famous by Dr. Frankenstein, the fictional scientist who used strange machines and lightning bolts to bring his artificial human creation to life. Like Dr. Frankenstein, 3D animators rely on technology to bring their creations to life. And like Dr. Frankenstein's 'artificial life machines', cartoonists' computers are absolutely powerless without a creative, dynamic human team to tell them what to do. Computers don't transform flat images to 3D creations and make them move, fly and speak. Animators do! The computer simply makes the animator's job easier.

One big advantage of using computers to create animation is that it makes the animator's job more efficient and mistakes are easier to correct. Imagine trying to hand draw an identical picture, say, of a dog catching a ball. It is very difficult to maintain the exact same size across several cels. With a computer the animator can program the first and the last frame of the action and the computer will fill in the frames in between. This process is called **tweening.** A related process called **morphing** is used to blend two images – for example showing a person's face age quickly.

Let's Talk About 3D

There is a lot of talk about 3D... 3D video games, websites, comic books and those new giant screen movies! Why do you need special glasses for some forms of 3D and not others?

When movies or TV shows are advertised as being 'in 3D' it means they were filmed especially for stereoscopic viewing. Using two strips of film running in synchronous time – one for each eye – you need special **polarized** glasses in order to see 3D images. An older way of showing 3D movies, called **anaglyph** 3D, involved one strip of film with two identical overlapping images using complementary colors for right and left-eye images. By wearing special filter glasses (usually red/blue) your eyes put them together as one 3D image.

When people talk about 3D computer animation or graphics, they refer to the use of computer software that renders a multi-dimensional image: using height, width and depth to give perspective and the ability to cast a shadow. Many video games use 3D animation for more realism. In most cases, you won't need special glasses to see 3D animation because the image, while created in three dimensions, is not being shown in stereo.

Visit www.foxnetwork.com for more information on Homer Simpson.

See The Difference

In *CyberWorld*, Homer Simpson walks through a '**morph**' wall. On television, Homer is normally a two-dimensional character, hand drawn by artists. In one special episode, Homer and Bart discover a new 3D world, created using 3D computer animation.

Activity 1

Look at the pictures of Homer Simpson.

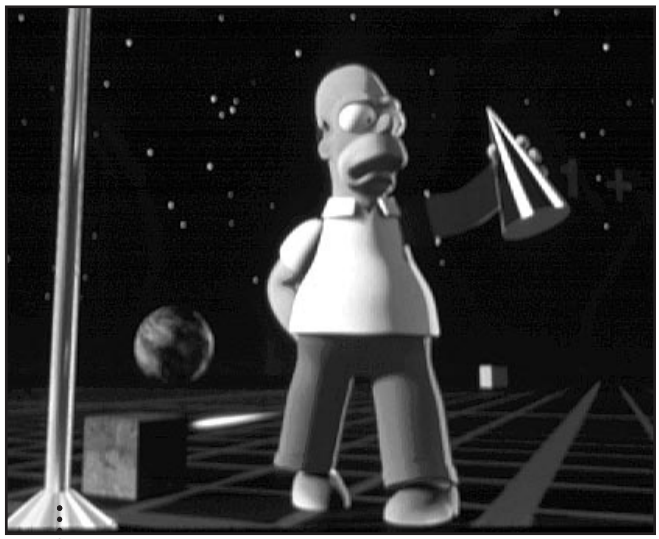
- What differences do you see?
- What techniques do you think the animators used to create Homer in *CyberWorld*?

Activity 2

Choose any scene from the film that shows the latest in animation technology.

- What did the animators do to make the scene appear realistic?
- Write a story about what you saw and how you think it was created.

Regular Homer is drawn in two dimensions using height and width to give him form.



"Hey, I'm bulge-y!" In 3D the added dimension of depth gives Homer a rounder shape!

DID YOU KNOW?

Most of us see in 3D naturally because we have binocular vision.

Who Owns It?

If you create a new character that is very distinctive, it belongs to you, and others would have to get your permission to use it! Legally you would own its copyright.

As animators begin to create their characters, they might inadvertently take an existing image and animate it. For example, a replica of a famous actor might become the focal point of a cartoon series. But everyone who creates original works, including animators, must be very careful. The use of the actor's replica is copyrighted and cannot be used unless permission is granted. Frequently, a fee is charged for use of the image, and sometimes that fee can be very expensive.

The issues of copyrights have become a big concern for musicians, writers and artists because of the ease of obtaining materials via the internet and through other digital technologies.

Is It Authentic?

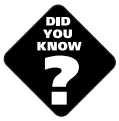
A question that is frequently asked is, "How can you trust what you see and hear?" In many large scale Hollywood movies, such as *The Patriot* and James Cameron's, *Titanic*, among others, many of the crowd scenes were made up of digital people. Since they were in the background, most people were not aware they were not real extras.

Now motion picture animators are working hard to create a realistic virtual actor. Unlike science-fiction creatures, or crowd scenes, creating a life-like digital actor is very challenging because the hair, skin, facial expression and body movement must look exactly human since audiences can be very unforgiving. People spend all day looking at other people's faces so they are experts at knowing what looks real.

Created by Spans & Partners, a German animation company, both the look and the voice of Sanchez are part of the character's copyright.

Left: Jenna Elfman Credit: Mark Fellman © 2000 IMAX Ltd.

If digital actors start to replace live actors, how could this change the film business?



Ananova, the world's first Internet newscaster, is entirely digital.

Activity 1

Asking Permission

1. Think about TV commercials or advertisements where famous people who are no longer living are used.
2. If you were to create a commercial, decide what famous character or person you might want to animate.
3. Write a letter requesting permission to use one of the characters in your advertisement. Explain who you are and why you wish to use the character's image. You will need to provide the following information:
   - The name of the character.
   - The dialogue spoken by the character (if any).
   - Where the ad will be used (number of times over a month's period).
   - Changes you might wish to make to the character's appearance (if any).
4. Ask a classmate to read your letter and suggest ways you might improve it.

Activity 2

What Do You Think?

If animators can create a realistic synthetic human, how could it be used?

Who would own the rights to this re-creation?

Should this be allowed if the person is not alive to give consent?

- Think carefully about these questions. What ideas or opinions do you have?
- Prepare a 2-3 minute speech on this issue to present to the class.
- Include both the positive and negative points of having this life-like person.

OR

Along with advances in music and recording technologies, a digital actor can be made to look like and sound exactly like a famous person from the past.

Virtual humans in other applications may act like **avatars** (graphic icons that represent a person) during training sessions or video-conferencing or for safety or military simulations.

- With some classmates, choose a topic to debate the advantages and disadvantages of each situation.
- Form two teams and decide which point of view each team will argue.
- Research and carefully think about your arguments.
- Hold your debate for the class.

Activity 3

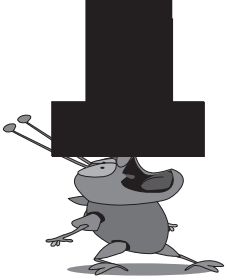
Create An Animated Advertisement

Your advertising agency has been asked to create an ad for a brand new product.

- In groups of two or three, design the advertisement.
- Think about the message you want to give to the public and create a slogan.
- Draw or animate the slogan on your computer or make a large poster.

Challenge

Research two or more advertising slogans from one idustry (eg. Cars, movies, clothing, soap) and present your findings to the class. How do the slogans differ? What do they tell you about the product? Which ones are most effective and why?



Computer Animation: Applications For Today's World

Section 4

In this section, students will learn about:

- some key characters in the animation industry
- practical applications of 3D technology

Computer Animation: A Key Tool For The Future

Computer animation is one of the key communication tools of the future. Not only is its popularity increasing in the entertainment field, but computer animation is used in many other industries.

For many years, scientists have been using computer animation as a vital research and development tool for scientific visualizations. For example, astrophysicists use computer animation to scientifically visualize the gravitational field of a black hole. Many industries also use computer animation for training and communicating. Computer animation is just as often used for practical everyday matters as well. For example, British Telecom uses an animation program to superimpose actual storm patterns over a plotted map of power faults in the UK to learn why and where increased faults are happening.

CLICK ON THIS!

To find out more about UNICEF's worldwide initiative to protect children's rights, visit www.unicef.org/crcartoons.

Credit: David Sessions ©1998 IMAX Ltd.

Several world organizations working in third world regions use animated films as an essential communications tools to convey vital information about health, safety and technology. Animation transcends language and conveys behavior in a way that is less intimidating or stereotypical. For such a project, started in 1994, UNICEF asked animators worldwide to create animations to inform children about their rights and society about its obligation to children. Every December, broadcasters from around the world broadcast *Cartoons for Children's Rights* to raise awareness about the UNICEF Convention on the Rights of the Child.

DID YOU KNOW ?

Animators are often hired to be part of a visual effects team on movies, television or commercials where special effects are blended with live action.

TEACHER NOTE

Also use this page in conjunction with the activity on page 18.

Careers In Animation

When a production studio decides to create an animated film, there are many jobs to be filled before the process can begin. Often employees handle different jobs, but generally they tend to specialize. Character animation requires a combination of talents so rare that *Fortune, The Wall Street Journal* and *The New York Times* regularly publish profiles of top animators.

Some of the positions available in a production studio include:

- director
- writer
- storyboard artist
- art director
- animator
- technical director
- layout artist
- production assistants

Director

The director is the person responsible for the overall product – for keeping the 'big picture' clearly in sight. The director goes over the intent of the shot to make sure the animator understands the characterization required. The director also passes final judgment on the animation. Directors can also be mentors. They generally have the most on-the-job experience of anyone on a production team, and are often more than willing to share their knowledge and offer advice.

Writer

The writer develops the script and helps the storyboard artist understand his or her ideas and intent. Frequently, after the storyboards are created, script changes are needed. The writer continues to participate in story sessions, and may make appropriate revisions to the script if needed.

Storyboard Artist

The storyboard artist translates the written script into a series of sketches and revises, adds, or deletes sketches during story sessions. Because storyboard artists work in 2D, they often draw character actions that are difficult to animate. Animators may work closely with the storyboard artist at the start to identify these sketches.

Animator

The animator's task is to bring a character to life by creating a sequence of poses that communicate personality. A computer can be programmed to make a model lip-sync any line of dialogue, but if the accompanying action is not convincing, the characterization fails. The production team relies on the animator to get the animation right. The director expects the animator to produce finished animation files, ready to be lighted and rendered.

Applications Of Animation In Today's World

Did you know that 3D animation offers many career opportunities? Besides the work in the animation industry for entertainment, computer animation is used in many diverse fields with different applications.

Courtesy Imagenius.com

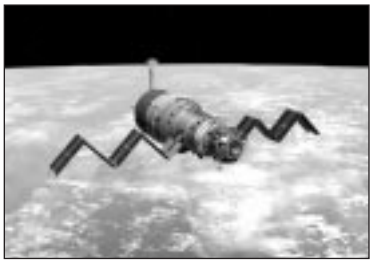
Architecture

Architects today use computer graphics to show what a new building will look like instead of creating expensive scale model replicas. Sometimes they create both the inside and outside of a structure using 3D animation software, and create a 'virtual' tour of the new building before it is built.

In the photos shown of downtown St. Louis, Missouri, Imagenius.com Inc., a Toronto-based, multi-media and computer graphics company, used 3D software to create a before-and-after view showing what a new office building would look like when it is finished. This helped city planners to see how it would fit into the exisiting community.

Space Science

Space scientists use computer animation to demonstrate how planets might look if we could go there, or how a new concept such as the deployment of solar panels on part of the International Space Station might work. Solar panels will use the sun's energy to power the space station. Visit NASA's picture website at http://nix.nasa.gov to view space-related computer animation clips. (TIP: type 'animation and movie' in the search box). Other interesting NASA computer animations can be found at the Langley Animation & Video Archive at http://lava.larc.nasa.gov.



Courtesy NASA

Paleontology

Because dinosaurs became extinct a long time before humans existed, much of paleontologist's work is like trying to put together a jigsaw puzzle with too many missing pieces. Paleontologists who uncover dinosaur fossils may wonder what the complete skeleton looked like. Computer animation is used to re-construct the look and behavior of extinct species based on fossil evidence. By doing this, paleontologists can learn why they became extinct. By looking at the skeleton of a Hadrasaur, for example, most scientists agree that they would have looked very similar to the ones shown in the photo.

Animation Is Not Just For Cartoons!

Animation has some powerful applications in today's world. Doctors use animation to show how tumors might develop in the body and how the heart works. By reproducing DNA using animation, scientists discover more about all living things. Animation helps astronomers identify new comets and predict the path they will follow. Engineers use animation to design bridges and check their structural requirements.

Activity 1

Animation At Work

- Research other applications of 3D animation in today's world. What are some of the other advantages of using 3D animation in this field?
- Plan how to present your ideas and findings.

OR

- Interview someone you know who works in a field where animation might be used. Find out how it's used today, and how it might be used in the future.
- Report your findings to the class.

Activity 2

What If?

What would have happened if Christopher Columbus had had 3D animation to guide him? Perhaps his trip to the Indies would have headed him in the right direction and he might never have landed on the shores of America!

- With a partner, choose an historical event and discuss what might have happened differently had 3D animation existed.

Researchers at MIT's Media lab are working on the next generation of a joy stick – an interactive plush toy that directs the actions of animated characters on computer screens.

Activity 3

Let's Think Ahead

- How will people use 3D animation in their daily lives in the future?
- With a partner, prepare a list of situations.
- Illustrate one of the situations and present it to another pair.
- Invite them to give their opinion about your ideas.

Activity 4

Simulations

- View the mathematics, science and art animation located in the Fantavision program. Once you have installed the program, select 'file', 'load movie' and type in the CD drive letter. Choose from the following filenames: _art, _math or _science.
- With the help of a dictionary, explain what 'simulation' means.
- Describe how an animated simulation can be helpful in the process of teaching and learning.

Challenge

Working alone or with a partner, think of a new invention that might be useful around the house or at school.

- Explain how you could use 3D animation to demonstrate its use.
- Write it out with a diagram showing the invention, or present your ideas to the class.

Resources

Teacher Note:
All of the suggested links throughout this guide were operational at the time of publication. Although we selected reliable sites from credible organizations, we cannot guarantee these links will always stay active. Cited as one of the web's most annoying features, broken links are caused when companies move sites, change servers or file names and forget to re-direct the old files to the new name.

Books

Let There Be Life! Animating With a Computer, by Christopher W. Baker, published by Walker & Co., 1997. Written for children, this book explains the concepts of computer animation in a visually appealing and easy to understand language.

Make Your Own Animated Movies and Videotapes, by Yvonne Andersen, published by Little, Brown, 1991

The Art of 3-D Computer Animation and Imaging, by Isaac Victor Kerlow, published by John Wiley & Sons; paperback ed. 1996.

Computer Literacy: A Graphics Animation Approach, by Mike Trusiewicz, published by Textbook Software Publishing, 1997. Visit www.textbooksoftware.com

Cartoons: One Hundred Years of Cinema Animation, by Gianalberto Bendazzi, pubished by Indiana University Press, 1994

Web Sites

www.warnerbros.com
See how Warner Brothers create their animations, and obtain info about the roles of individuals involved. Click on 'Kids', then 'Animation 101'.

www.imax.com
Find out more about the company behind the technology. IMAX Corporation's main site includes a map and list of theatres worldwide as well as film library info.

cyberworld.imax.com
Official *CyberWorld* movie site includes background info, photos, contest.

www.textbooksoftware.com
Fantavision's official website. Find our more about this animation program with a section aimed at K-12 teachers.

www.siggraph.org

'The official organization for computer animators has a SigKids site which can be reached from Siggraph's 'electronic schoolhouse'.

www.animationartist.com/playland
Animation Artist Magazine's site is filled with great information about animation as well as a bright, well designed activity area for young people with an animation painter program, games, trivia, mazes, and more.

www.bergen.org/AAST/ComputerAnimation
Academy for the Advancement of Science And Technology site includes comprehensive background on computer animation as well as more 'real world' applications.

www.ncsa.uiuc.edu
National Center for Supercomputing Applications is a world leader in visual simulations. Site shows how cutting edge technology can help industries maintain a competitive edge in a global economy.

Video

Animation For Kids 'How To Make Your Cartoons Move!', by Patrick Jenkins, VHS, 12 minutes, color, sound.
Visit www.interlog.com/~pjenkins for ordering information.

Computer Animation Software

www.hyperstudio.com
Hyperstudio's educational software lets you create your own CD style multimedia projects without learning complicated new skills. All age levels.

www.microsoft.com
Microsoft 3D Movie Maker is a fun program for ages 8 -14. Shows the steps involved in making a movie. Select from a variety of characters, sounds, props, backgrounds to create your own 3D animated movies.

Credits & Acknowledgements

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Puppets - The Animation School

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Science Museum IMAX Cinema and BFI London IMAX Cinema,
London, UK.

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